Atty. Dkt. No. 039153-0460 (G1165)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Buynoski et al.

Title: METHOD OF SELF-ANNEALING CONDUCTIVE LINES THAT SEPARATES GRAIN SIZE EFFECTS FROM ALLOY MOBILITY

Appl. No.: 10/628,733

Filing Date: 07/28/2003

Examiner: Joannie A. Garcia

Art Unit: 2823

Conf. No.: 4021

CERTIFICATE OF EXPRESS MAILING

I hereby certify that this correspondence is being deposited with the United States Postal Service's "Express Mail Post Office To Addressee" service under 37 C.F.R. § 1.10 on the date indicated below and is addressed to: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

EV 505573021 US (Express Mail Label Number) 08/25/04 (Date of Deposit)

Roberta A. Cooper (Printed Name)

Roberta A. Cooper (Signature)

DECLARATION UNDER 37 C.F.R. § 1.131

Commissioner for Patents
PO Box 1450
Alexandria, Virginia 22313-1450

Sir:

We, Matthew S. Buynoski, Connie Pin-Chin Wang, Paul R. Besser, and Minh Q. Tran state and declare that:

1. Each of us is an inventor of at least one of Claims 1-20 currently pending in U.S. Patent Application No. 10/628,733 titled "METHOD OF SELF-ANNEALING CONDUCTIVE LINES THAT SEPARATES GRAIN SIZE EFFECTS FROM ALLOY MOBILITY" (hereinafter "the '733 application").

2. We understand that in an Office Action dated July 8, 2004, each of Claims 1-20 were rejected as being unpatentable in view of U.S. Patent No. 6,660,633 to Lopatin et al. titled "METHOD OF REDUCING ELECTROMIGRATION IN A COPPER LINE BY ELECTROPLATING AN INTERIM COPPER-ZINC ALLOY THIN FILM ON A COPPER SURFACE AND A SEMICONDUCTOR DEVICE THEREBY FORMED" (hereinafter "Lopatin et al.").

3. We understand based on the information provided on the front page of Lopatin et al. that Lopatin et al. has a filing date of February 26, 2002.

4. At least by August 21, 2001, we conceived in the United States the ideas set forth in Claims 1-20 of the '733 application. Such conception is evidenced by the attached

Exhibit A, which is an invention disclosure form pertaining to the subject matter of the present application.

5. Based on the conception of the ideas set forth in Claims 1-20 at least by August 21, 2001, the subject matter recited in Claims 1-20 was invented by us prior to the February 26, 2002 filing date of Lopatin et al.

6. We hereby declare that all statements made herein of our own knowledge are true and that all statements made on information and belief are true, and further that these statements are made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the patent application or any patent issuing therefrom.

Date: 12 August 2004 By: _____
Matthew S. Buynoski

Date: 8/23/04 By: _____
Connie Pin-Chin Wang

Date: 8/18/04 By: _____
Paul R. Besser

Date: 8/23/04 By: _____
Minh Q. Tran

TUESDAY, AUGUST 21, 2001
COPPER ALLOY PATENT HARVESTING SESSION #72
GROUP 1: ROOM C-617
Technical Leader: Connie Wang
TOPIC: PROCESS

1-9

PRIORITY
A ___ B X
C ___ D ___

AMD INVENTION DISCLOSURE TLD ID#: G1165 Rec'd date ______
Sunnyvale x42110, return to MS68, Texas x55964 return to MS562

Project: ☐, **Product:** ☐, **Process:** ☐, **Technology** ☐, **to which the invention applies (*identify*):**

______

List 2 to 5 key words useful to search by to find patents or art related to this invention:

______

Working title of invention: Separating Cu grain size effects from alloy mobility by use of self-annealing.

→INVENTOR/SESSION PARTICIPANT ADDRESS INFORMATION IS ON THE NEXT PAGE (1A)←

Inventor's signature : ______ **date :** ______
Inventor's printed full name: Matthew Buynoski Citizenship: ______
Employee #: ______ Extension: ______ Mail stop: ______ Home telephone:( ) ______
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Co-Inventor's signature : ______ date : ______
Co-Inventor's printed full name: ______ Citizenship: ______
Employee #: ______ Extension: ______ Mail stop: ______ Home telephone:( ) ______
Division: ______ Directorate: ______ Dept #: ______ Dept : ______ Manager: ______
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Post Office address: ______

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Co-Inventor's printed full name: ______ Citizenship: ______
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Residence address: ______
Post Office address: ______

Co-Inventor's signature : ______ date : ______
Co-Inventor's printed full name: ______ Citizenship: ______
Employee #: ______ Extension: ______ Mail stop: ______ Home telephone:( ) ______
Division: ______ Directorate: ______ Dept #: ______ Dept : ______ Manager: ______
Residence address: ______
Post Office address: ______

List on additional sheet if there are more co-inventors and list total number of inventors here: ______
Name(s) of attorney(s) preferred by inventor(s) to prepare patent application, if known:

______

LAW FIRM: FOLEY & LARDNER
ATTORNEYS: Paul Hunter and Joe Ziebert

Witness 1 initial: ______ Witness 2 initial: ______

TDG-Copper Alloy Patent Harvesting Session
Group 1 Topic: Process Issues

Technical Leader: Pin-Chin Connie Wang
Law Firm: Foley & Lardner (Paul Hunter & Joe Ziebert)

PARTICIPANT ADDRESSES
Tuesday, August 21, 2001—ROOMS C-6&7

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You, Lu Lu.You@amd.com	PEOPLE'S REPUBLIC OF CHINA	023537	07198	160	408/749-6589	408/749-5144	5978 Friar Way	San Jose	CA	95129

IDF PAGE 1A

Exhibit A

AMD INVENTION DISCLOSURE TLD ID#_____ Rec'd date _____

California x42110, return to MS68, Texas x55964 return to MS562, Dresden x83401 Silke Kretzschmar at MS E21-PP.

Identify known relevant art (patents, publications, products): Cu is well known to self-anneal at room temp following electroplated depositions

State the problem solved by this invention: Blocking of ~~diffusion~~ electromigration by alloying elements in Cu crossing grainboundaries ~~is~~ dependent on both Cu grain size & alloy element diffusion kinetics. This separates them.

Brief description and/or sketch of invention (*please attach copies of AMD patent notebook pages, reports or drawings*):

Instead of using a furnace at typ 250-350C to anneal Cu gridlines, the Cu metal is "self annealed" at ambient from ambient temperature for 24-48 hrs to ~~@~~ <100C for 8-24hrs. There is no appreciable motion of alloying element when the ~~grains~~ Cu re-crystallization occurs. Anneal conditions in subsequent furnace anneal can now be tailored exclusively to needs of distributing the alloying element, without ~~the~~ affecting the Cu grain structure. Also, fewer grain boundaries (post self-anneal) result in a given amt of alloying element being more concentrated in the grain boundaries, requiring use of less alloy ~~element~~ in bulk to reach an effective level. This leads to lower overall line resistance.

Patent notebook # _____ Page numbers_____ Number of drawings_____

Witness 1 initial: _____ Witness 2 initial: _____

AMD INVENTION DISCLOSURE

TLD ID#_____ Rec'd date _____

California x42110, return to MS68, Texas x55964 return to MS562, Dresden x83401 Silke Kretzschmar at MS E21-PP.

Advantages (check all that apply):

☐ avoids existing patent(s)	☐ improves precision	☐ simplifies manufacturing
☐ new function	☐ improves accuracy	☐ improves wear characteristic
☐ improves density	☐ improves efficiency	☐ improves signal to noise ratio
☐ increases operating speed	☐ fewer component parts	☐
☐ improves reliability	☐ reduces cost of manufacturing	☐

Discussion of advantage of the invention over other solutions
(*emphasize technical advance in the art* as measured against known art):_____

First written description* of invention, date:	First external disclosure to (name):
Date of first drawing*: Date invention first reduced to practice:	Date of first external disclosure, none ☐ External disclosure under NDA* No ☐ Yes ☐
Made by (name): Tested by (name):	First external disclosure or use by: presentation ☐, announcement ☐, sample ☐, sale ☐, other ☐
Date of first computer simulation:	Date of Non-Disclosure Agreement*, if any:
Date of first successful test:	Date of first publication*:
any of above occurred outside of USA ☐	Publication name:
* *attach copy if possible*	Date of first commercial use:

Does plan exist to publish, disclose or sell? If so, where and when?_____
Was invention conceived, constructed or tested pursuant to the performance under a development contract with another company: No ☐, Yes ☐. If yes, company name_____
If yes, name of AMD business contact and contract no._____
Was invention jointly developed with participation of inventors from outside AMD: No ☐, Yes ☐.
If yes, Company name_____

I have read and understood this disclosure and read and signed each page of the attachments:

Witness 1 signature:_____ Date:_____
Printed name:_____ Employee #:_____

Witness 2 signature:_____ Date:_____
Printed name:_____ Employee #:_____

After completing to this point, deliver to department reviewer: date delivered:

Witness 1 initial: _____ Witness 2 initial: _____

AMD INVENTION DISCLOSURE TLD ID#_____ Rec'd date _____

California x42110, return to MS68, Texas x55964 return to MS562, Dresden x83401 Silke Kretzschmar at MS E21-PP.

DISCLOSURE EVALUATION (*Entries from this point on are by the Reviewer*)

Does this invention add value to the AMD intellectual property portfolio? Yes ☐, No ☐,
Explain:_____

Do you know of any relevant art? Yes ☐, No ☐, If yes, attach a copy and explain: _____

What application(s) do you foresee for this invention? _____

I estimate the Value* of this invention disclosure is **A** ☐, **B** ☐, **C** ☐, **D** ☐,
** use worksheet "Valuing Invention Disclosures and Patents".*
it is ☐, is **not** ☐ recommended to AMD for **U.S. patent application** filing,
it is ☐, is **not** ☐ recommended to AMD for **foreign patent application** filing,
it is ☐, is **not** ☐ recommended to be held as an AMD **trade secret**,
Give this high priority ☐, **normal** ☐, **low priority** ☐, **in patent application writing.**

GUIDELINES AND CONSIDERATIONS FOR FOREIGN FILING DECISION
Filing foreign patent applications is costly. We should choose to do it only when conditions warrant.
ALL CONDITIONS BELOW MUST APPLY IN ORDER TO INITIATE A FOREIGN FILING:

- ***Invention is High-Valued (A, B)*, and***
- ***Invention is in our technology path (usage), and***
- ***Invention usage is detectable by inspection of product, and***
- ***Invention is relatively hard to design around, and***
- ***Competitor is operating in the country of interest.*** *(see ca000000.xls tabulation of "Factory Sites outside the USA .)*

I recommend filing patent applications in foreign countries checked below:

Japan ☐	S.Korea ☐	Taiwan ☐	U.K. ☐	France ☐	Germany ☐
☐	☐	☐	☐	☐	☐

Reviewer's signature:_____ Employee #:_____ Date:_____

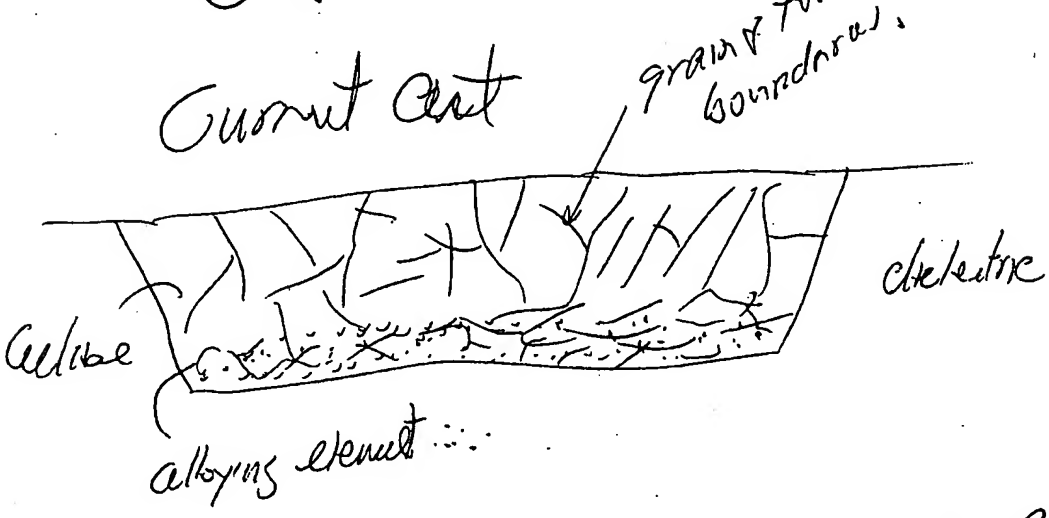
Reviewer's printed name: _____ If foreign filing is checked, route to ***Div. VP*** for signature.

VP or Designate approves foreign filing (signature)_____

Reviewer: Complete this page and send disclosures to TLD for patent application filing.

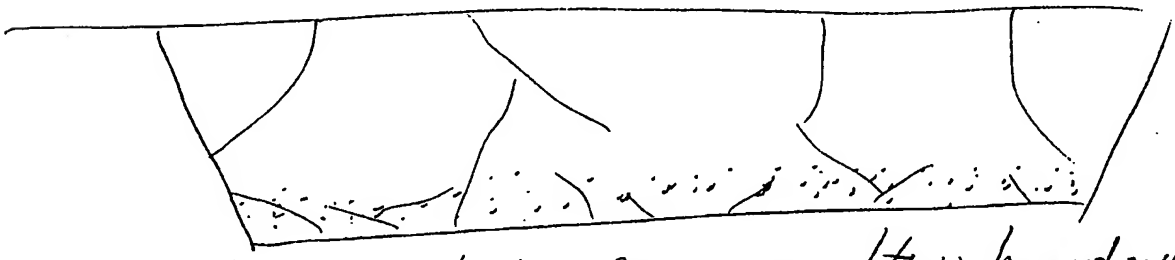
#72

Current art



alloying element moves up large # of grain bdries & may prevent some from being destroyed during anneal.

Proposed — Cu line after self-anneal



alloying element has fewer grain/twin boundaries to fill up & passivate. Overall, fewer boundaries mean less diffusion for grain/bdry diffusion.